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PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2004-184569

(43)Date of publication of application : 02.07.2004

(51)Int.Cl.

G03G 5/07
B41J 2/44
G03G 5/06
G03G 5/147
G03G 15/04

(21)Application number : 2002-349402

(71)Applicant : CANON INC

(22)Date of filing : 02.12.2002

(72)Inventor : TAKATANI ITARU

KAWAHARA MASATAKA

TANAKA TAKAKAZU

OGAKI HARUNOBU

NAKAJIMA YUKA

(54) ELECTROPHOTOGRAPHIC PHOTORECEPTOR, PROCESS CARTRIDGE HAVING ELECTROPHOTOGRAPHIC PHOTORECEPTOR AND ELECTROPHOTOGRAPHIC DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a electrophotographic photoreceptor free from the absorption of monochromatic light even when the photoreceptor is used for an electrophotographic device provided with an exposure means having monochromatic light source of 400-410 nm wavelength and having high sensitivity, high mechanical strength of wear resistance/scratch resistance and stable repeatability and to provide a process cartridge having the electrophotographic photoreceptor and the electrophotographic device.

SOLUTION: In the electrophotographic photoreceptor having a photosensitive layer on a support, the surface is exposed by the monochromatic light source of 400-410nm wavelength and the photosensitive layer contains a charge producing material and a high-molecular charge transfer material having a specific repeating structural unit.

LEGAL STATUS

[Date of request for examination]

05.09.2005

[Date of sending the examiner's decision of

0049
CTB

rejection]

[Kind of final disposal of application other than
the examiner's decision of rejection or
application converted registration]

[Date of final disposal for application]

[Patent number]

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[Claim(s)]

[Claim 1]

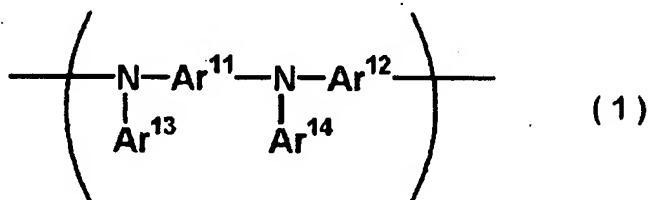
In the electrophotography photo conductor which has a sensitization layer on a base material,

A front face is exposed by the source of the homogeneous light which is the wavelength of 400-410nm,

The amount charge transportation matter of macromolecules which has the repeat structural unit this sensitization layer is indicated to be by the charge generating matter and the following formula (1) is contained.

The electrophotography photo conductor characterized by things.

[External Character 1]



(Ar11 and Ar12 show the divalent radical containing an aromatic hydrocarbon ring machine, or the divalent radical containing an aromatic series aromatic heterocycle radical independently among a formula (1), respectively.) Ar13 and Ar14 show independently the univalent aromatic heterocycle radical which is not permuted [the univalent aromatic hydrocarbon ring machine which is not permuted / a permutation or /, a permutation, or], respectively. However, the case of Ar11=Ar12 and Ar13=Ar14 is removed. n shows three or more integers.

[Claim 2]

The electrophotography photo conductor according to claim 1 with which either [in said formula (1) / at least] Ar11 or Ar12 have the structure shown by the following formula (2).

[External Character 2]

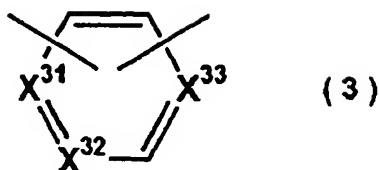


(Ar21 and Ar22 show independently the divalent aromatic hydrocarbon ring machine which is not permuted [a permutation or] among a formula (2), respectively.) X21 shows the alkylene group which is not permuted [a permutation or], a siloxane radical, a silylene radical, a carbonyl group, a sulfonyl group, an oxygen atom, or a sulfur atom.

[Claim 3]

The electrophotography photo conductor according to claim 1 or 2 with which either [in said formula (1) / at least] Ar11 or Ar12 have the structure shown by the following formula (3).

[External Character 3]



(X31, X32, and X33 show independently the trivalent carbon atom which is not permuted [a permutation or] or a nitrogen atom among a formula (3), respectively.) However, at least one of X31, X32, and the X33 is a nitrogen atom.

[Claim 4]

The electrophotography photo conductor according to claim 1 to 3 said whose sensitization layer is a laminating mold sensitization layer which has a charge transportation layer containing the amount charge transportation matter of macromolecules which has the repeat structural unit shown by the charge generating layer containing said charge generating matter, and said formula (1) in this order from said base material side.

[Claim 5]

The electrophotography photo conductor according to claim 1 to 4 which has a surface protective layer on said sensitization layer.

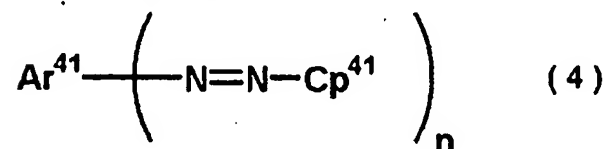
[Claim 6]

The electrophotography photo conductor according to claim 1 to 5 which is the hydroxy gallium phthalocyanine which has 7.4 degrees of an angle of diffraction [in / at least / in a kind / CuKalpha characteristic-X-ray diffraction] (2theta**0.2 degree) of said charge generating matter, and a peak strong against 28.2 degrees.

[Claim 7]

The electrophotography photo conductor according to claim 1 to 6 which is the azo pigment in which a kind has at least the structure of said charge generating matter shown by the following formula (4).

[External Character 4]



(Ar41 shows the aromatic heterocycle radical of a permutation or no permuting which may be combined through an aromatic hydrocarbon ring machine [of of a permutation or no permuting which may be combined through a direct or joint radical], direct, or joint radical among a formula (4).) Cp41 shows the coupler residue which has a phenolic hydroxyl group. n shows the integer of 1-4.

[Claim 8]

The electrophotography photo conductor according to claim 1 to 7 whose weight average molecular weight of the amount charge transportation matter of macromolecules which has the repeat structural unit shown by said formula (1) is 5000 or less [1000 or more].

[Claim 9]

The electrophotography photo conductor according to claim 8 whose weight average molecular weight of the amount charge transportation matter of macromolecules which has the repeat structural unit shown by said formula (1) is 3000 or less [1500 or more].
[Claim 10]

At least one means chosen from the group which serves as an electrophotography photo conductor from an electrification means, a development means, an imprint means, and a cleaning means is supported to one, and is set to the process cartridge which can be freely detached and attached on the body of electrophotography equipment,

This electrophotography photo conductor is an electrophotography photo conductor according to claim 1 to 9,

This electrophotography equipment has a source of the homogeneous light with a wavelength of 400-410nm as an exposure means.

The process cartridge characterized by things.

[Claim 11]

In the electrophotography equipment which has an electrophotography photo conductor, an electrification means, an exposure means, a development means, and an imprint means,

This electrophotography photo conductor is an electrophotography photo conductor according to claim 1 to 9,

It has the source of the homogeneous light this whose exposure means is the wavelength of 400-410nm.

Electrophotography equipment characterized by things.

[Claim 12]

Electrophotography equipment according to claim 11 said whose light source is laser or LED.

[Claim 13]

Electrophotography equipment according to claim 12 said whose laser is solid state laser.

[Claim 14]

Electrophotography equipment according to claim 13 which is the laser with which said solid state laser oscillates a double wave using a nonlinear optical element.

[Claim 15]

Electrophotography equipment according to claim 13 said whose solid state laser is semiconductor laser.

[Claim 16]

Electrophotography equipment according to claim 15 said whose semiconductor laser is semiconductor laser using a nitriding gallium compound.

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2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

This invention relates to an electrophotography photo conductor, a process cartridge, and electrophotography equipment.

[0002]

[Description of the Prior Art]

The image formation by the electrophotography method is uniformly charged in the front face of an electrophotography photo conductor, exposes this by a laser beam etc., forms an electrostatic latent image, develops a developer (toner) to an electrostatic latent image, and is performed by the process of imprinting a developed image (toner image) to imprint material, such as paper.

[0003]

That is, if a front face exposes the electrophotography photo conductor charged uniformly, the potential of the front face of an electrophotography photo conductor will ***** , and an electrostatic latent image will be formed in an exposure part. If development bias is applied between the electrophotography photo conductor with which this electrostatic latent image was formed, and the developer support which supports a developer, an electrostatic latent image will be developed according to the potential difference of exposure afterpotential and development bias potential. Then, image formation is made by imprint material by imprinting the developed image formed in this way to imprint material.

[0004]

When adopting a laser beam (laser light) here as an exposure light for exposing the electrophotography photo conductor after uniform electrification, it is common that red laser light (about 630-780nm) is used.

[0005]

In recent years, the high resolution-ization is progressing accelerative for the improvement in image quality of the output image of electrophotography equipment. The correspondence on the electrophotography equipment for this purpose is comparatively easy from an optical field. That is, it is attained because raising resolution extracts the diameter of a spot of a laser beam thinly and it raises a write-in consistency.

[0006]

However, in the semiconductor laser whose oscillation wavelength currently conventionally used as the light source of exposure is about 630-780nm, even if it made the beam diameter thin by actuation of optical system, it turned out that the clearness of the profile of the beam spot is hard to be obtained. It is the function with which the cause is in the diffraction limitation of laser light because with which the minimum of the diameter of a spot (D) is in direct proportion to the wavelength (λ) of laser light, and is because it is expressed with the following type (NA expresses lens numerical aperture).

[0007]

$$D=1.22 \lambda / NA$$

Since the oscillation wavelength is about 630-780nm and long wavelength, the red laser light generally used from the former in the electrophotography process has the problem that it is difficult to extract a beam diameter to a minor diameter, and it cannot raise recording density to an electrophotography photo conductor above to some extent, so that clearly from the above-mentioned formula.

[0008]

In order to solve this problem, it is required to shorten oscillation wavelength of semiconductor laser. Some technique is mentioned to short wavelength-ization of the oscillation wavelength of laser light.

[0009]

One uses a non-linear optical material and it sets wavelength of laser light to 1/2 using a second harmonic generation (SHG) (it indicates to JP,9-275242,A, JP,9-189930,A, JP,5-313033,A, etc.). Since a technique is already established and this system can use the GaAs system LD and YAG laser in which high power is possible as the primary light source, reinforcement and high-power-izing are possible for it.

[0010]

Compared with the device of SHG use, the miniaturization of equipment is possible for another using a wide gap semi-conductor. LD using a ZnSe system semi-conductor (it indicates to JP,7-321409,A, JP,6-334272,A, etc.) and a GaN system semi-conductor (it indicates to JP,8-088441,A, JP,7-335975,A, etc.) is set from the height of the luminous efficiency as the object of research of before to many.

[0011]

However, optimization of component structure, crystal growth conditions, an electrode, etc. was difficult for such LD, and the long duration oscillation at an indispensable room temperature was difficult for it to utilization by the defect under crystal etc.

[0012]

However, technological innovation, such as a base, progresses, continuous oscillation (50-degree-C conditions) is reported in October, 1997 from Nichia Chemical Industries, Ltd. by LD which used the GaN system semi-conductor for 1150 hours, sale will be started in October, 1999, and it is becoming realistic to use 400-410nm laser light for electrophotography equipment as an exposure light.

[0013]

The laminating of many electrophotography photo conductors used now is carried out to the order of a charge generating layer and a charge transportation layer from the base material side of conductivity [lamination / the]. It is necessary to send in laser light through a charge transportation layer at a charge generating layer for making it discover high sensitivity in the case of this lamination efficiently. That is, it is important that a charge transportation layer does not absorb such light.

[0014]

A general charge transportation layer is the about 10-30-micrometer film which carried out molecular dispersion of the low-molecular-weight charge transportation matter into binding resin. Moreover, in many electrophotography photo conductors, the copolymer of bisphenol system polycarbonate resin, or it and other resin is used as binding resin. Since this bisphenol system polycarbonate resin does not have absorption in a 400-410nm wavelength region, also when oscillation wavelength of semiconductor laser is shortened and exposure light is set to 400-410nm, it does not serve as hindrance of transparency.

[0015]

However, there is much what absorbs the wavelength of 400-410nm, and in order to absorb the irradiated light in a charge transportation layer and not to reduce photosensitivity, it is necessary to choose what does not absorb the wavelength of 400-410nm as the low-molecular-weight charge transportation matter used from the former.

[0016]

Furthermore, the service condition of an electrophotography photo conductor while improvement in the speed of the electro photographic printer which adopted the electrophotography method, an electrophotography copying machine, etc., a miniaturization, and high definition-ization progress as mentioned above now is becoming still severer, and physical-properties amelioration of the much more raise in durability and the surface layer of an electrophotography photo conductor is more important for it.

[0017]

As a means which raises the so-called endurance of the organic electrophotography photo conductor using the organic photoconductivity matter The approach of carrying out macromolecule quantification of the binding resin, and the approach of adding a filler in binding resin, By or the thing for which the structure for giving lubricity, such as siloxane structure and a fluorine content substituent, into the structure of binding resin is introduced, or a solid lubricant like polytetrafluoroethylene (PTFE) is added The method of reducing coefficient of friction with cleaning means, such as a cleaning blade, etc. is learned.

[0018]

Furthermore, although use of various binding resin excellent in the mechanical strength is also proposed, even if binding resin itself is excellent in the mechanical strength, in order to mix and use the charge transportation matter of low molecular weight, film reinforcement of binding resin original cannot fully be harnessed, but it has come to acquire not necessarily sufficient endurance in abrasion resistance and damage resistance.

[0019]

Although what is necessary is just to reduce the addition of the charge transportation matter to add in order to harness the film reinforcement of binding resin original, the problem of causing the fall of electrophotography sensibility and the rise of rest potential arises in that case, and it has come to be compatible in film reinforcement and electrophotographic properties.

[0020]

Moreover, lubricity can be given to a sensitization layer, the method of reducing coefficient of friction with cleaning means, such as a cleaning blade, can also cause the fall of the film reinforcement of a sensitization layer, and sufficient endurance has not been acquired.

[0021]

On the other hand, use of the amount charge transportation matter of macromolecules was indicated by JP,64-9964,A, JP,2-282263,A, JP,3-221522,A, JP,8-208820,A, etc. in order to improve the film fall on the strength by addition of the low-molecular-weight charge transportation matter, but a manufacturing cost is very high and these many had a not suitable fault in practical use, even when it did not necessarily have sufficient abrasion resistance and had a certain amount of film reinforcement.

[0022]

Moreover, although many proposals which prepare a surface protective layer on a sensitization layer are also made in recent years, when the low-molecular-weight charge transportation matter is used for a sensitization layer and a surface protective layer is prepared on it, the poor degree of hardness of a deposit of the low-molecular-weight charge transportation matter or a surface protective layer may pose a problem.

[0023]

[Problem(s) to be Solved by the Invention]

Even if it uses the purpose of this invention for electrophotography equipment equipped with an exposure means to have a source of the homogeneous light with a wavelength of 400-410nm, it is to offer the process cartridge and electrophotography equipment which do not absorb this homogeneous light, but have high sensibility, and have the electrophotography photo conductor which whose mechanical strength of abrasion resistance and damage resistance was strong, and was excellent in repeat stability, and this electrophotography photo conductor.

[0024]

[Means for Solving the Problem]

this invention persons came to complete this invention, as a result of repeating examination wholeheartedly.

[0025]

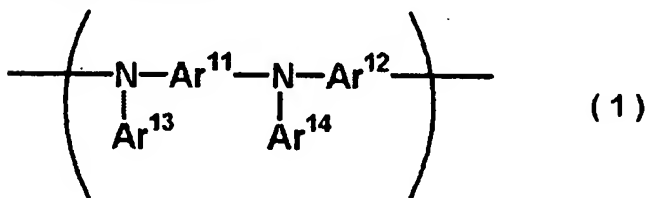
That is, this invention is set to the electrophotography photo conductor which has a sensitization layer on a base material,

A front face is exposed by the source of the homogeneous light which is the wavelength of 400-410nm,

It is the electrophotography photo conductor characterized by containing the amount charge transportation matter of macromolecules which has the repeat structural unit this sensitization layer is indicated to be by the charge generating matter and the following formula (1).

[0026]

[External Character 5]



[0027]

(Ar¹¹ and Ar¹² show the divalent radical containing an aromatic hydrocarbon ring machine, or the divalent radical containing an aromatic series aromatic heterocycle radical independently among a formula (1), respectively.) Ar¹³ and Ar¹⁴ show independently the univalent aromatic heterocycle radical which is not permuted [the univalent aromatic hydrocarbon ring machine which is not permuted / a permutation or /, a permutation, or], respectively. However, the case of Ar¹¹=Ar¹² and Ar¹³=Ar¹⁴ is removed. n shows three or more integers.

Moreover, this invention supports to one at least one means chosen from the group which serves as an electrophotography photo conductor from an electrification means, a development means, an imprint means, and a cleaning means, and sets it to the process cartridge which can be freely detached and attached on the body of electrophotography equipment,

This electrophotography photo conductor is the above-mentioned electrophotography photo conductor,

This electrophotography equipment is the process cartridge characterized by having a source of the homogeneous light with a wavelength of 400-410nm as an exposure means.

[0028]

Moreover, this invention is set to the electrophotography equipment which has an electrophotography photo conductor, an electrification means, an exposure means, a development means, and an imprint means,

This electrophotography photo conductor is the above-mentioned electrophotography photo conductor,

This exposure means is electrophotography equipment characterized by having the source of the homogeneous light which is the wavelength of 400-410nm.

[0029]

[Embodiment of the Invention]

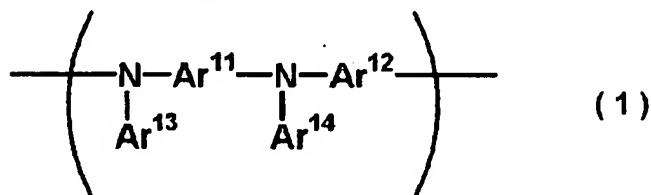
Hereafter, this invention is explained more to a detail.

[0030]

The electrophotography photo conductor applied to electrophotography equipment equipped with an exposure means to have a source of the homogeneous light with a wavelength [of this invention] of 400-410nm is characterized by containing the amount charge transportation matter of macromolecules which has the repeat structural unit the sensitization layer on a base material is indicated to be by the charge generating matter and the following formula (1) as above-mentioned.

[0031]

[External Character 6]



[0032]

(Ar¹¹ and Ar¹² show the divalent radical containing an aromatic hydrocarbon ring machine, or the divalent radical containing an aromatic series aromatic heterocycle radical independently among a formula (1), respectively.) Ar¹³ and Ar¹⁴ show independently the univalent aromatic heterocycle radical which is not permuted [the univalent aromatic hydrocarbon ring machine which is not permuted / a permutation or /, a permutation, or], respectively. However, the case of Ar¹¹=Ar¹² and Ar¹³=Ar¹⁴ is removed. n shows three or more integers.

As Ar¹³ in the above-mentioned formula (1) </SUP>, and a univalent aromatic

hydrocarbon ring machine of Ar14, a phenyl group, a naphthyl group, an anthryl radical, a pyrenyl radical, a fluorenyl group, a phenanthrene radical, etc. are mentioned, and a quinolyl radical, a dibenzothiophenyl radical, a dibenzofuryl radical, n-methyl carbazole group, n-ethyl carbazole group, n-tolyl carbazole group, etc. are mentioned as a univalent aromatic heterocycle radical.

[0033]

Moreover, as for either [in the above-mentioned formula (1) / at least] Ar11 or Ar12 it is desirable to have the structure shown by the following type (2) or (3).

[0034]

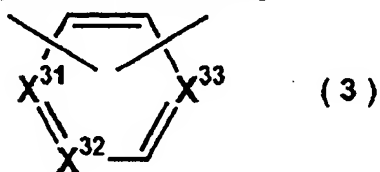
[External Character 7]



[0035]

(Ar21 and Ar22 show independently the divalent aromatic hydrocarbon ring machine which is not permuted [a permutation or] among a formula (2), respectively.) X21 shows the alkylene group which is not permuted [a permutation or], a siloxane radical, a silylene radical, a carbonyl group, a sulfonyl group, an oxygen atom, or a sulfur atom.

[External Character 8]



[0036]

(X31, X32, and X33 show independently the trivalent carbon atom which is not permuted [a permutation or] or a nitrogen atom among a formula (3), respectively.) However, at least one of X31, X32, and the X33 is a nitrogen atom.

As a divalent aromatic hydrocarbon ring machine of Ar21 and Ar22 in the above-mentioned formula (2), the radical which took two hydrogen atoms from aromatic hydrocarbon rings, such as benzene, naphthalene, an anthracene, perylene, a fluorene, a biphenyl, and terphenyl, is mentioned.

[0037]

A methylene group, ethylene, a propylene radical, etc. are mentioned as an alkylene group of X21 in the above-mentioned formula (2).

[0038]

Moreover, as a substituent which each above-mentioned radical may have, J1 permutation amino groups, such as halogen atoms, such as aryloxy groups, such as alkoxy groups, such as alkyl groups, such as a methyl group, an ethyl group, a propyl group, and butyl, and a methoxy group, an ethoxy radical, a propoxy group, and a phenoxy group, a naphthoxy radical, and a fluorine atom, a chlorine atom, a bromine atom, and a dimethylamino radical, a diethylamino radical, a diphenylamino radical, etc. are mentioned.

[0039]

Since the electrophotography photo conductor of the electrophotography photo conductor of this invention contains the amount charge transportation matter of macromolecules which has the repeat structural unit a sensitization layer is indicated to be by the above-mentioned formula (1), it stops easily being able to absorb the homogeneous light with a wavelength of 400-410nm, and has the features, like there is almost no sensibility fall by the exposure absorption of light in a sensitization layer. If it is the amount charge transportation matter of macromolecules which has the structure by which either [of the above-mentioned formula (1) / at least] Ar11 or Ar12 are shown by the above-mentioned formula (2) or (3), the effectiveness will be acquired much more notably.

[0040]

Moreover, since the sensitization layer contains the amount charge transportation matter of macromolecules when a sensitization layer turns into a surface layer of an electrophotography photo conductor (in the case of the electrophotography photo conductor which does not prepare surface protective layer with an another sensitization layer), the effectiveness that the fall of the film reinforcement of binding resin original by adding the charge transportation matter is small, and the mechanical strength of electrophotography photo conductors, such as abrasion resistance and damage resistance, is excellent is also acquired.

[0041]

Furthermore, the amount charge transportation matter of macromolecules which has the structure by which either [of the above-mentioned formula (1) / at least] Ar11 or Ar12 are shown by the above-mentioned formula (2) or (3) Compared with the amount charge transportation matter of macromolecules to which the polymerization of the low-molecular-weight charge transportation matter which has thoria reel amine structure was carried out simply, it is harder coming to absorb the homogeneous light with a wavelength of 400-410nm, and also has the features, like there is almost no sensibility fall by the exposure absorption of light in a sensitization layer.

[0042]

As for the weight average molecular weight of the amount charge transportation matter of macromolecules which has the repeat structural unit shown by the above-mentioned formula (1), it is desirable that it is [or more 1000] 5000 or less, and it is more desirable that it is [or more 1500] 3000 or less.

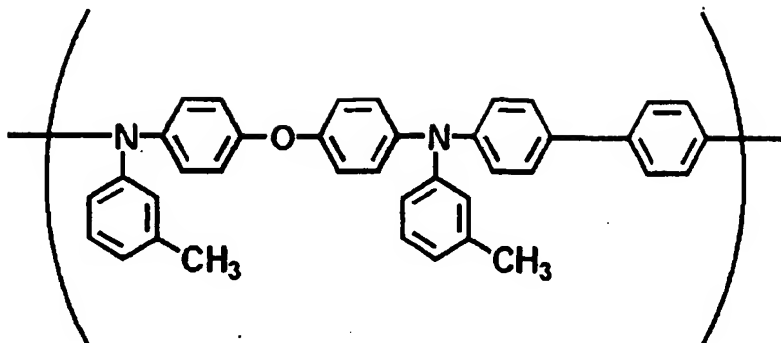
[0043]

Although the suitable example of the repeat structure of the amount charge transportation matter of macromolecules used for the sensitization layer of the electrophotography photo conductor of this invention is shown below, this invention is not limited to these.

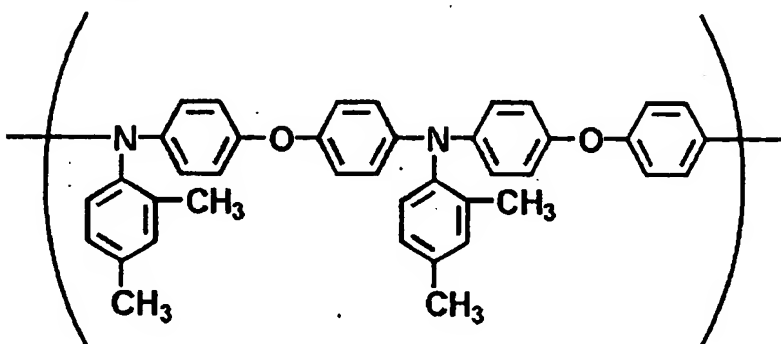
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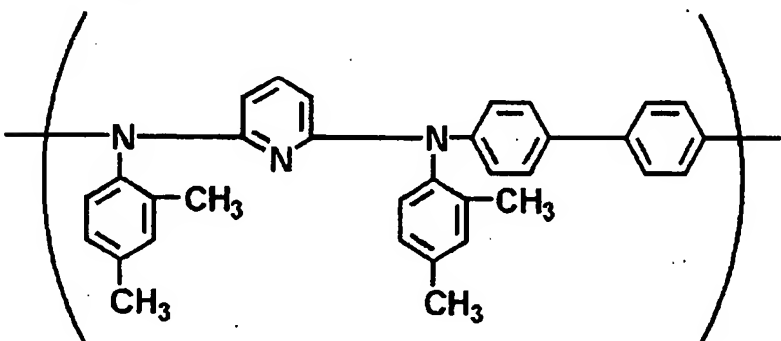
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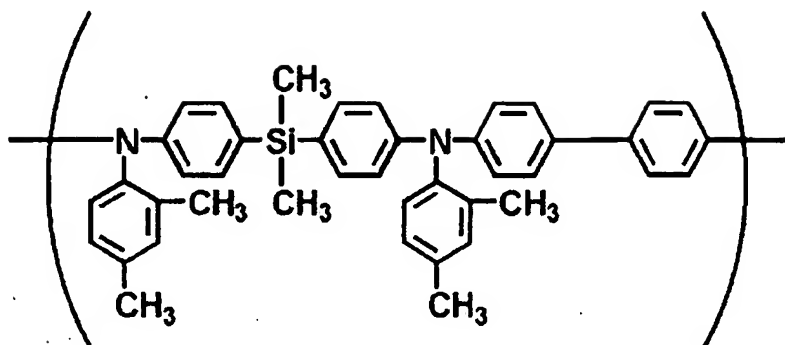
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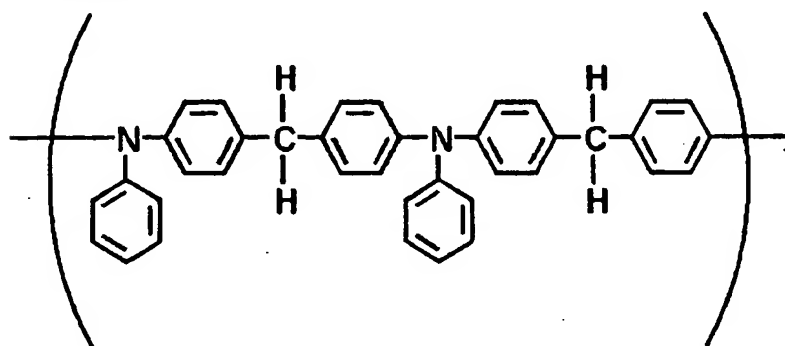
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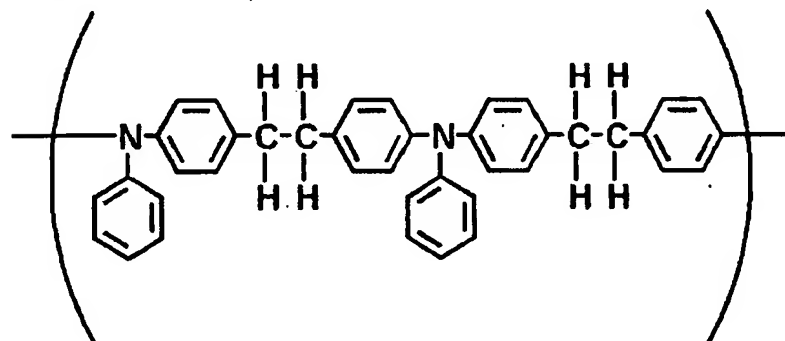
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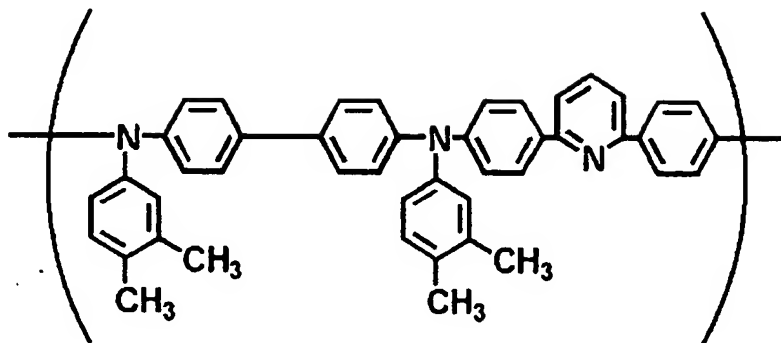
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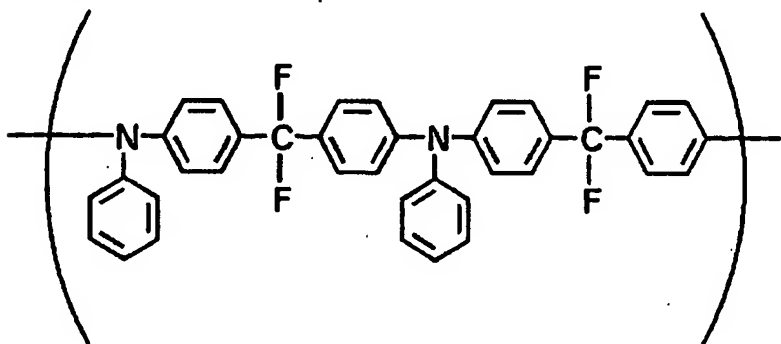
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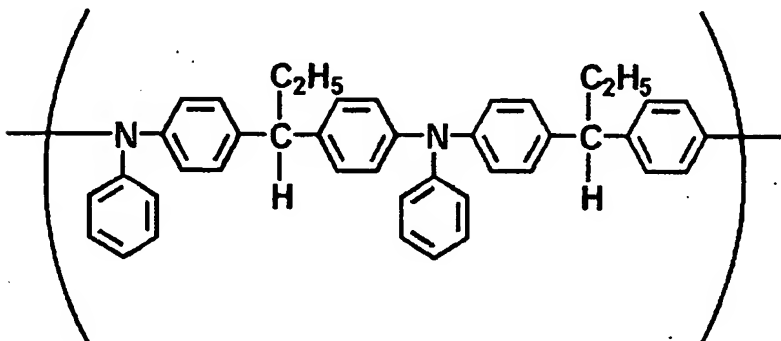
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(CT-8)



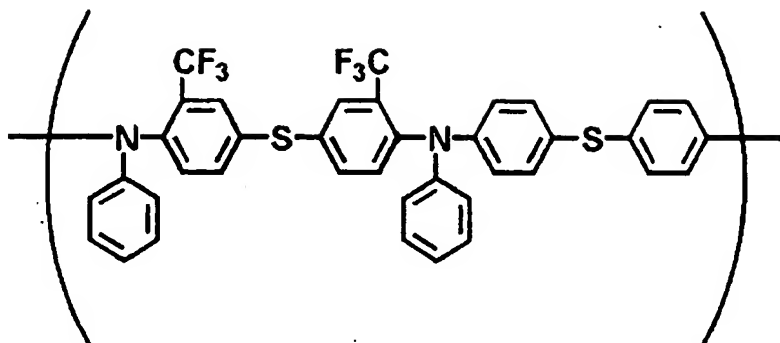
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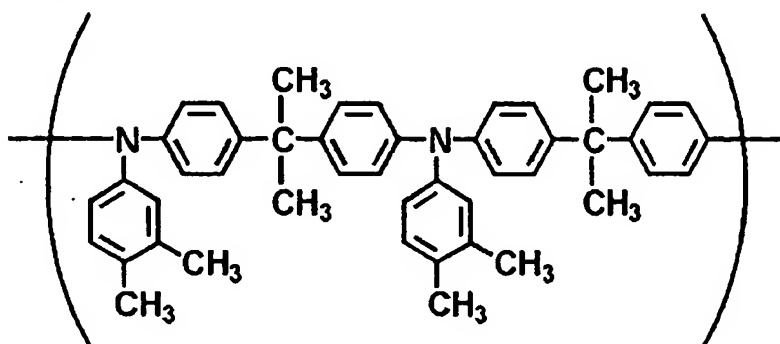
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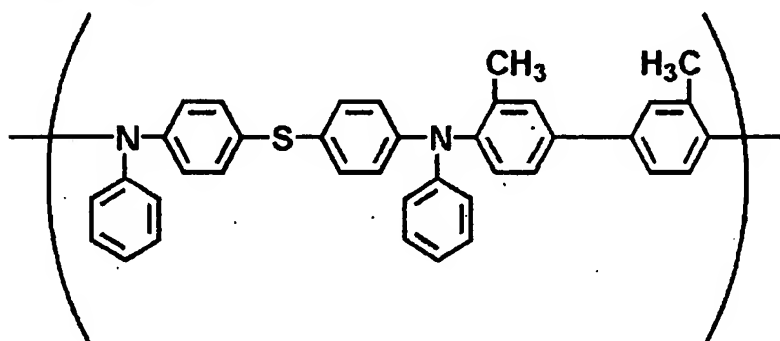
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(CT-11)



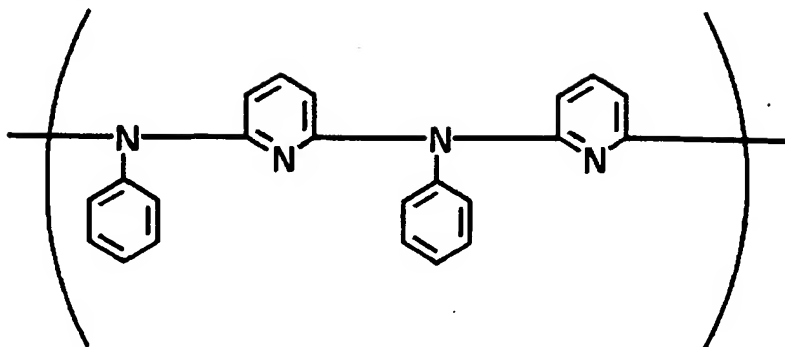
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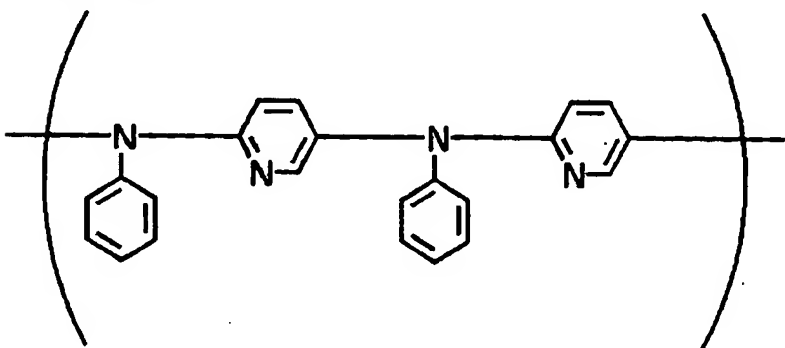
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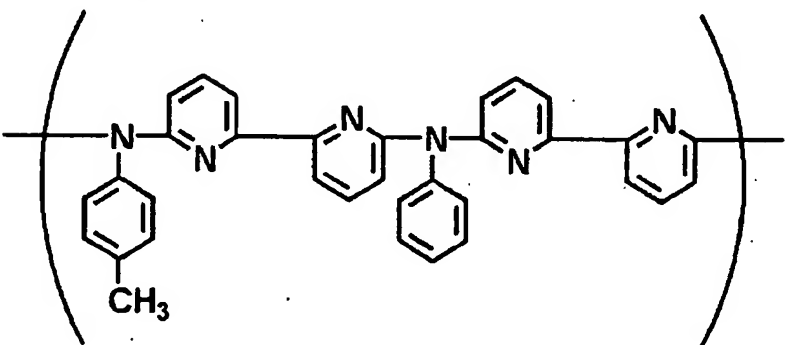
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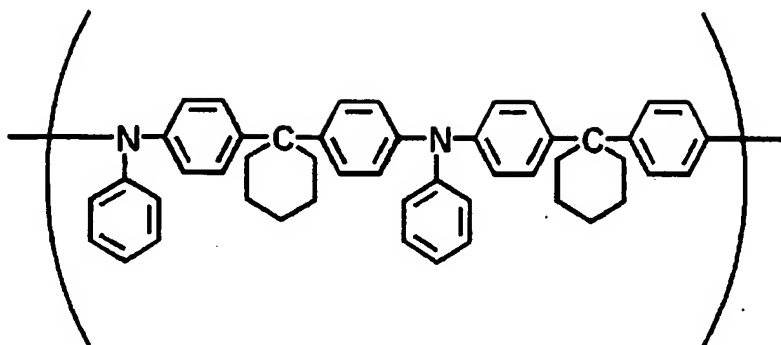
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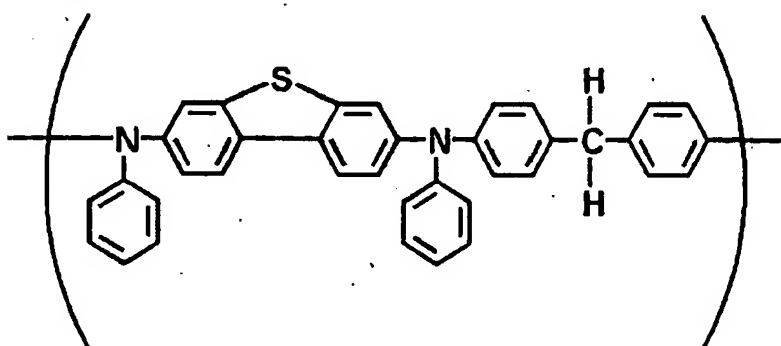
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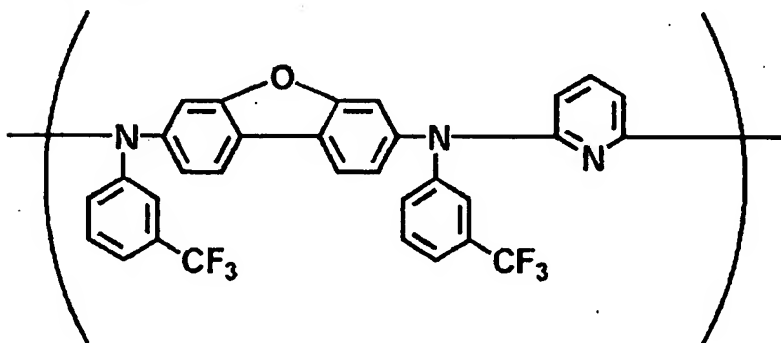
(CT-16)



(CT-17)



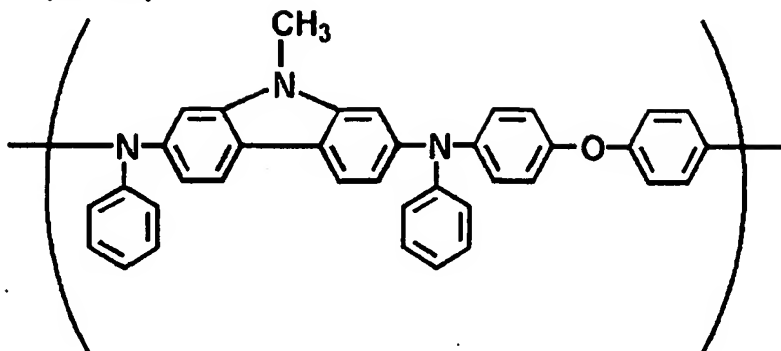
(CT-18)



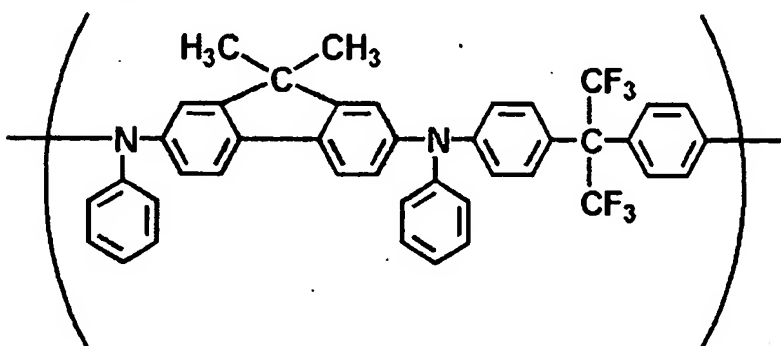
[0050]

[External Character 15]

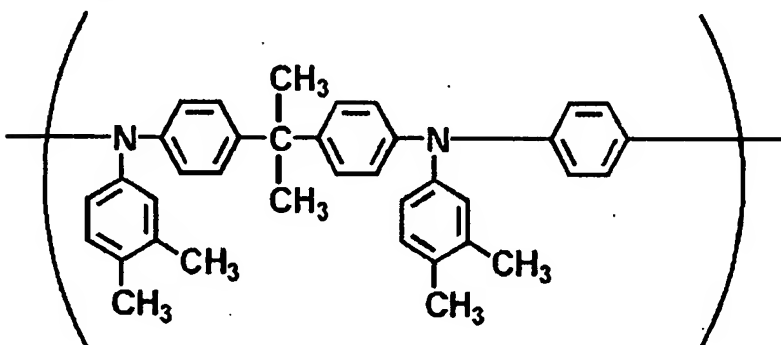
(CT-19)



(CT-20)



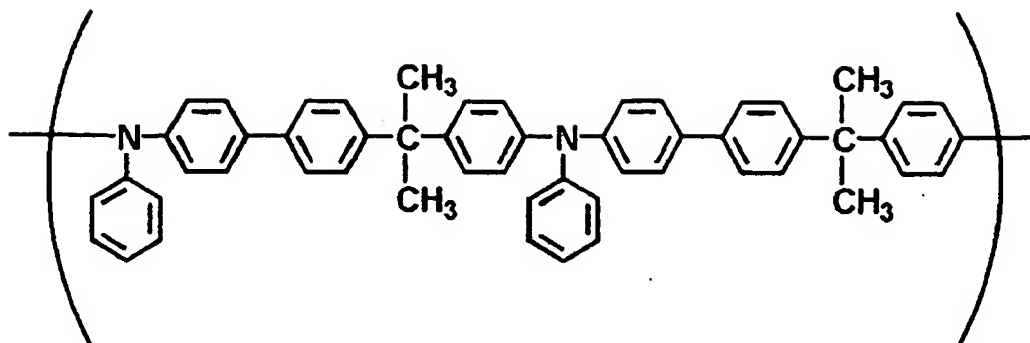
(CT-21)



[0051]

[External Character 16]

(CT-22)



[0052]

Also in these, CT-1 and CT-2 are more desirable.

[0053]

You may have one kind of repeat structural unit shown by the above-mentioned formula (1), and two or more kinds of amount charge transportation matter of macromolecules used for the sensitization layer of the electrophotography photo conductor of this invention may have it. Furthermore, you may use it, mixing with the existing charge transportation matter. however, the charge transportation component of the amount charge transportation matter of macromolecules which has the repeat structural unit shown by the above-mentioned formula (1) from a viewpoint of fully acquiring the effectiveness of this invention -- 50 - 100-mol% of all charge transportation components - existing is desirable.

[0054]

Hereafter, the configuration of the electrophotography photo conductor of this invention is explained.

[0055]

Even if the sensitization layer of the electrophotography photo conductor of this invention is a monolayer mold sensitization layer which contains the amount charge transportation matter of macromolecules which has the repeat structural unit shown by the charge generating matter and the above-mentioned formula (1) in the same layer You may be the laminating mold sensitization layer which carried out the laminating to the charge generating layer containing the charge generating matter, and the charge transportation layer containing the amount charge transportation matter of macromolecules which has the repeat structural unit shown by the above-mentioned formula (1). Moreover, when it is a laminating mold sensitization layer, even if it is the sequential layer mold sensitization layer which carried out the laminating to the order of a charge generating layer and a charge transportation layer from the base material side, you may be the inversional layer mold sensitization layer which carried out the laminating to the order of a charge transportation layer and a charge generating layer from the base material side. From a viewpoint of electrophotographic properties, a laminating mold sensitization layer is desirable and a sequential layer mold sensitization layer is more desirable also in it.

[0056]

Moreover, the surface protective layer aiming at protecting the front face of an electrophotography photo conductor may be prepared on a sensitization layer as above-mentioned.

[0057]

Metals, such as aluminum and stainless steel, or the metal which prepared the conductive layer, paper, plastics, etc. are mentioned that the base material of the electrophotography photo conductor of this invention should just be what has conductivity, and, as for a configuration, the shape of the shape of a sheet and a cylinder etc. is mentioned.

[0058]

Moreover, the interference fringe prevention by dispersion of exposure light or the conductive layer aiming at covering the blemish of a base material may be prepared. This is carbon black. Binding resin can be distributed and conductive fine particles, such as metal particles, can be formed. The thickness of a conductive layer has desirable 5-40 micrometers, and its further 10-30 micrometers are more desirable.

[0059]

The interlayer who has an adhesion function may be prepared on a base material or a conductive layer. As the middle class's ingredient, a polyamide, polyvinyl alcohol, polyethylene oxide, ethyl cellulose, casein, polyurethane, polyether polyurethane, etc. are mentioned. These are dissolved and applied to a suitable solvent. An interlayer's thickness has desirable 0.05-5 micrometers, and its further 0.3-1 micrometer is more desirable.

[0060]

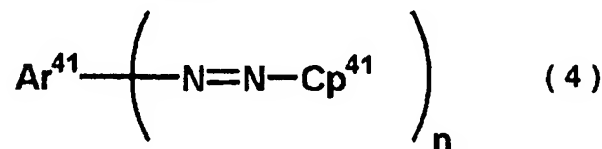
When adopting a sequential layer mold sensitization layer as a sensitization layer, a charge generating layer is formed on a base material, a conductive layer, or an interlayer.

[0061]

As charge generating matter, each pigment of a selenium-tellurium, pyrylium, a thia pyrylium system color, a phthalocyanine, anthanthrone, a JIBENZU pyrene quinone, tris azo, cyanine, JISUAZO, monoazo, indigo, Quinacridone, and an unsymmetrical kino cyanine system is mentioned. Also in them, azo pigments, such as a phthalocyanine pigment or monoazo JISUAZO tris azo, are desirable, and the hydroxy gallium phthalocyanine which has 7.4 degrees and the peak strong against 28.2 degrees of the angle of diffraction ($2\theta \approx 0.2$ degree) in CuK α characteristic-X-ray diffraction, or the azo pigment which has the structure shown by the following formula (4) is more desirable also in them.

[0062]

[External Character 17]



[0063]

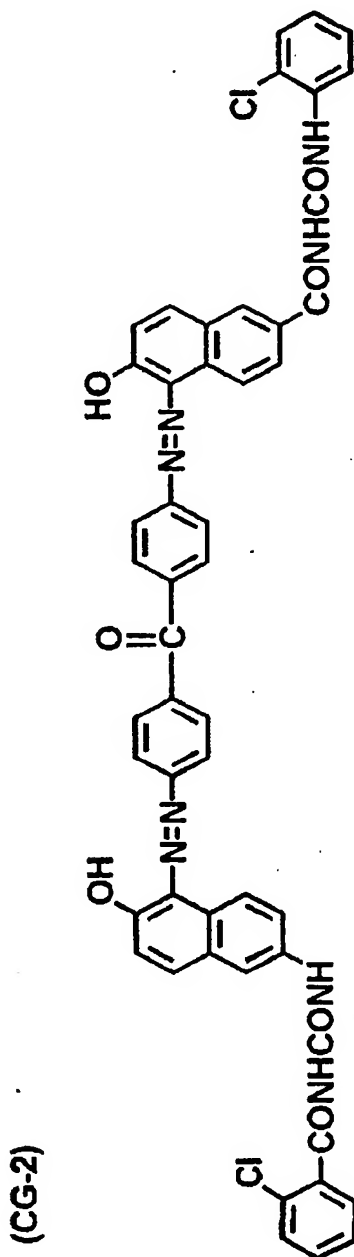
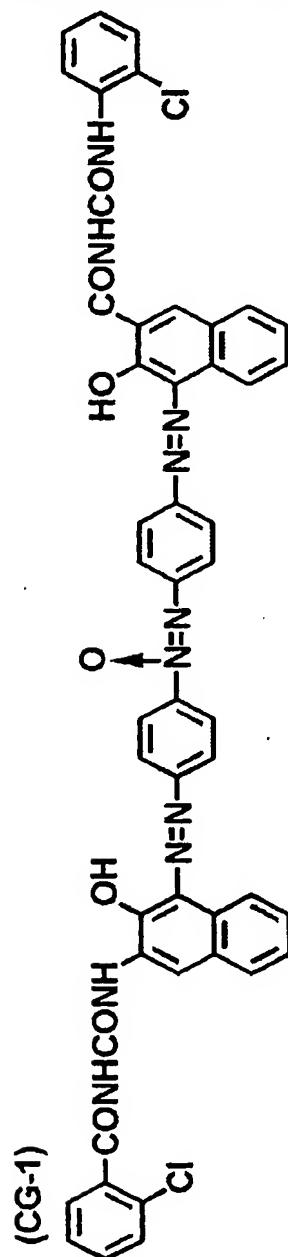
(Ar⁴¹ shows the aromatic heterocycle radical of a permutation or no permuting which may be combined through an aromatic hydrocarbon ring machine [of of a permutation or no permuting which may be combined through a direct or joint radical], direct, or joint

radical among a formula (4).) Cp41 shows the coupler residue which has a phenolic hydroxyl group. n shows the integer of 1-4.

The suitable example of the azo pigment which has the structure shown by the above-mentioned formula (4) is shown below.

[0064]

[External Character 18]



[0065]

In the case of a laminating mold sensitization layer, a charge generating layer carries out

coating and desiccation of the dispersion liquid which often distributed the above-mentioned charge generating matter with the binding resin and the solvent of an amount 0.3 to 4 times by approaches, such as a homogenizer, ultrasonic distribution, a ball mill, a vibration ball mill, a sand mill, attritor, a roll mill, and a liquid collision mold high-speed disperser, and were obtained, and forms them. The thickness of a charge generating layer has desirable 5 micrometers or less, and its further 0.1-2 micrometers are more desirable.

[0066]

In the case of a sequential layer mold sensitization layer, a charge transportation layer is prepared on a charge generating layer. A charge transportation layer carries out coating and desiccation of the coating made to dissolve binding resin into a solvent further if needed [the amount charge transportation matter of macromolecules and if needed] have the repeat structural unit shown by the above-mentioned formula (1), and forms it. The thickness of a charge transportation layer has desirable 5-40 micrometers, and its further 15-30 micrometers are more desirable.

[0067]

In this invention, the amount charge transportation matter of macromolecules and binding resin which have beforehand the repeat structural unit shown by the above-mentioned formula (1) may be made to react partially, and the structure of cross linkage may be given. In this case, what is necessary is just the solution or dispersion liquid which does not have trouble in coating.

[0068]

In this invention, the amount charge transportation matter of macromolecules which has the repeat structural unit shown by the above-mentioned formula (1) may be independently used for a charge transportation layer, or binding resin may be used together. When using binding resin, as for the amount charge transportation matter of macromolecules which has the repeat structural unit shown by the above-mentioned formula (1), it is desirable to combine with the binding resin of the amount of 0.5 - 2 double (mass ratio).

[0069]

As binding resin used for a charge transportation layer, a polycarbonate, polyester, polyurethane, the poly ape phone, a polyamide, polyarylate, polyacrylamide, a polyvinyl butyral, phenoxy resin, acrylic resin, acrylonitrile resin, methacrylic resin, phenol resin, an epoxy resin, alkyd resin, etc. are mentioned.

[0070]

An additive can be used for above-mentioned each class for amelioration of a mechanical property, or the improvement in endurance besides the above-mentioned ingredient. As an additive, an antioxidant, an ultraviolet ray absorbent, a stabilizing agent, a cross linking agent, lubricant, a conductive control agent, an inorganic filler, etc. are used. As lubricant, a fluorine atom content resin particle, a silicon particle, and a silicone particle are mentioned, and a fluorine atom content resin particle is more desirable also in it. As a fluorine atom content resin particle, it is desirable to choose suitably one sort or two sorts or more from tetrafluoroethylene resin, 3 fluoride-salt-ized ethylene resin, 6 fluoride [ethylene propylene] resin, polyvinyl fluoride, polyvinylidene fluoride resin, 2 fluoride ethylene-dichloride resin, and these copolymers, and tetrafluoroethylene resin and polyvinylidene fluoride resin are still more desirable. Inorganic fillers, such as an alumina, a silica, and a barium sulfate, may be added in order to raise the degree of

hardness of an added layer.

[0071]

Although what is necessary is just to have the source of the homogeneous light whose main wavelength is 400nm - 410nm as the exposure light source adopted as the electrophotography equipment of this invention, in the point that the homogeneous light can be acquired efficiently, it is desirable that they are laser or LED. When using laser for the exposure light source, in the point that equipment can be miniaturized, it is desirable to use solid state laser. The semiconductor laser of the thing which oscillates the double wave of a near infrared, using a nonlinear optical element as solid state laser, or the quantum well mold structure of having oscillation wavelength in the range of 400nm - 410nm is desirable, and the laser using the nitriding gallium compound as semiconductor laser is desirable.

[0072]

Next, an example of the outline configuration of electrophotography equipment equipped with the process cartridge which has the electrophotography photo conductor of this invention is shown in drawing 1.

[0073]

In drawing 1, 8 is the image scanner section (manuscript base), and is a part which reads a manuscript and performs digital signal processing. In the image scanner section 8, it is decomposed into each signal of a yellow color (Y), a cyanogen color (C), a Magenta color (M), and a black color (Bk), and image information is sent to the laser exposure optical unit (exposure means) 3. In the development unit (development means) 1, the development counter of yellow color development counter 1Y, cyanogen color development counter 1C, magenta color development counter 1M, and black color development counter 1Bk is arranged, and formation of a full color image is performed by the following procedures.

[0074]

In the electrophotography equipment of a configuration of being shown in drawing 1, image exposure is performed by the laser light which the electrophotography photo conductor 7 was charged in homogeneity with the primary electrification vessel (electrification means) 2, next was modulated by the yellow color picture signal, an electrostatic latent image is formed and development is performed by yellow color development counter 1Y fixed beforehand in the development location.

[0075]

The developed yellow toner image is imprinted on the imprint material by which the imprint drum 5 was adsorbed, the electrophotography photo conductor 7 is cleaned with a cleaner (cleaning means) 4, and is again charged with the primary electrification vessel (electrification means) 2, and image exposure is carried out by the following cyanogen color picture signal.

[0076]

Development unit 1Y leaves a development location, and following cyanogen development counter 1C is fixed in a predetermined development location, and it performs cyanogen development in the meantime.

[0077]

Then, the above strokes are performed about a Magenta and black, respectively, and the toner image of 4 classification by color is imprinted by the imprint material by which the

imprint drum was adsorbed. Then, imprint material passes the fixing unit 6 and paper is delivered to it.

[0078]

Among components, such as the electrophotography photo conductor 7, the electrification means 2, the development means 3, and the cleaning means 4, it may combine with one, and may constitute by using two or more things as a process cartridge, and this process cartridge may be constituted removable to bodies of electrophotography equipment, such as a copying machine and a laser beam printer.

[0079]

Next, the synthetic example of the amount charge transportation matter of macromolecules which has the repeat structural unit shown by the above-mentioned formula (1) is shown.

[0080]

(Synthetic example 1) 2,2'-bis[4-(4-methylphenyl)benzidine] 5.6g and 4-BUROMO phenyl ester 5.1g were dissolved in 20ml of desiccation O-xylene, acetic-acid palladium 10mg and 2-(G tert-butyl HOSUFENO) biphenyl 55mg were added, and heating reflux was performed for 4 hours. After radiationnal cooling, except for the catalyst, it flowed into the acetone and the yellow solid-state was obtained. Furthermore, the obtained solid-state was again dissolved in toluene, activated carbon treatment, column chromatography, and reprecipitation refined, and 2.2g of light yellow solid-states was obtained. The obtained light yellow solid-state was the amount charge transportation matter of macromolecules which has the repeat structural unit shown by (CT-1).

[0081]

(Synthetic examples 2-22)

The amount charge transportation matter of macromolecules which has the repeat structural unit shown by - (CT-2) (CT-22) was compounded using the same reaction as the synthetic example 1, respectively.

[0082]

The eight sections, the bisphenol Z mold polycarbonate (trade name: Z-200, Mitsubishi Gas Chemical Co., Inc. make) 10 section, and the monochlorobenzene 80 section were mixed for the amount charge transportation matter of giant molecules which has the repeat structural unit shown by (CT-2), and the coating liquid for charge transportation layers was produced. My YABA was used and applied on the PET sheet, hot-air-drying processing of this coating liquid was carried out at 120 degrees C for 1 hour, and the 10-micrometer charge transportation layer was produced as a film. The film of this charge transportation layer was exfoliated from the PET sheet, and the absorption spectrum was measured with the spectrophotometer.

[0083]

(CT-3) And (CT-4) also about the amount charge transportation matter of macromolecules which has the repeat structural unit shown, the film of a charge transportation layer was produced by the same approach, and the absorption spectrum was measured.

[0084]

As for the permeability of the homogeneous light with a wavelength of 405nm, (CT-2) was 73%, (CT-3) was 69%, and (CT-4) was 38%. That is, when it exposes using 400-

410nm laser light, it is possible to make a charge transportation layer penetrate. The absorption spectrum of the amount charge transportation matter of macromolecules which has the repeat structural unit shown by (CT-2), and the amount charge transportation matter of macromolecules which has the repeat structural unit shown by (CT-3) is shown in drawing 2 and drawing 3, respectively.

[0085]

(Examples 1-2 of comparison composition)

The amount charge transportation matter of macromolecules which has the repeat structural unit shown by (CT-23), and the amount charge transportation matter of macromolecules which has the repeat structural unit shown by (CT-24) were compounded using the same reaction as the synthetic example 1.

[0086]

(CT-3) And (CT-4) also about the amount charge transportation matter of macromolecules which has the repeat structural unit shown, the film of a charge transportation layer was produced by the same approach as the above-mentioned synthetic example, and the absorption spectrum was measured.

[0087]

As for the permeability of the homogeneous light with a wavelength of 405nm, (CT-23) and (CT-24) were 0%. The absorption spectrum of the amount charge transportation matter of macromolecules which has the repeat structural unit shown by (CT-23) is shown in drawing 4.

[0088]

[Example]

Hereafter, according to an example, this invention is further explained to a detail.

[0089]

(Example 1)

The dip painting cloth of the coating for conductive layers which distributed for 2 hours and adjusted the two quart processing barium-sulfate 10 of SnO(s) section, the titanium oxide 2 section, the phenol resin 6 section, the methyl-cellosolve 16 section, the methanol 4 section, and the silicone oil (poly methyl siloxane polyoxyalkylene copolymer, weight average molecular weight 3000) 0.001 section with the sand mill equipment using a glass bead with a diameter of 1mm was carried out on the aluminum cylinder with an outer diameter of 180mm, it was dried for 30 minutes at 140 degrees C, and the conductive layer of 15 micrometers of thickness was formed.

[0090]

Next, coating of the solution which dissolved the alcoholic fusibility copolyamide (trade name Amilan CM-8000, Toray Industries, Inc. make) 5 section in the methanol 95 section was carried out by the dip painting cloth method on the above-mentioned conductive layer, it was dried for 10 minutes at 80 degrees C, and the interlayer whose thickness is 0.5 micrometers was formed.

[0091]

Next, after the sand mill equipment using a glass bead with a diameter of 1mm distributed the hydroxy gallium phthalocyanine 4 section, the polyvinyl-butyril (trade name: S lek BX-1, Sekisui Chemical Co., Ltd. make) 2 section, and the cyclohexanone 60 section which have 7.4 degrees and the peak strong against 28.2 degrees of the angle of diffraction (2theta**0.2 degree) in the X diffraction spectrum of CuKalpha for 4 hours,

the ethyl acetate 100 section was added and the dispersion liquid for charge generating layers were prepared. Coating of this was carried out by the dip painting cloth method on the above-mentioned interlayer, and the charge generating layer of 0.2 micrometers of thickness was formed.

[0092]

next, the synthetic example 1 -- having compounded (CT-1) -- coating of the solution made to dissolve the amount charge transportation matter of giant molecules 9.2 section and the bisphenol Z mold polycarbonate (trade name: Z-200, Mitsubishi Gas Chemical Co., Inc. make) 10 section which has the repeat structural unit shown in the monochlorobenzene 90 section was carried out by the dip-painting cloth method on the above-mentioned charge generating layer, it dried for 60 minutes at 110 degrees C, and the charge transportation layer of 15 micrometers of thickness formed.

[0093]

Thus, the electrophotography photo conductor was obtained.

[0094]

When evaluated by carrying the produced electrophotography photo conductor in the reconstruction machine (the exposure means having been changed into LD whose oscillation wavelength is 405nm, and optical system having been changed so that-izing of the spot system could be carried out [minor diameter]) of CLC1100 by Canon, Inc. of the equipment configuration shown in drawing 1, the repeatability of 1 dot of 400dpi on an electrophotography photo conductor concerns with the existence of a contiguity dot and was good.

[0095]

Moreover, when it supplied if the toner was lost by the intermittent mode stopped once for every one print, and 10000 sheet copy paper durability was performed, the problem did not appear in the image.

[0096]

(Example 2)

Even the interlayer formed like the example 1.

[0097]

Next, in addition to the liquid which dissolved the polyvinyl benzal (whenever [BENZARU-ized] 75% or more) 2 section in the cyclohexanone 95 section, the azo pigment 5 section which has the structure shown by (CG-1) was distributed by the sand mill for 20 hours, the solution was produced, this solution was applied on the above-mentioned interlayer, carried out hot air drying at 105 degrees C for 10 minutes, and the charge generating layer of 0.3 micrometers of thickness was formed.

[0098]

Next, the charge transportation layer was formed like the example 1, and the electrophotography photo conductor was obtained.

[0099]

When the produced electrophotography photo conductor was evaluated like the example 1, the repeatability of 1 dot of 400dpi on an electrophotography photo conductor concerns with the existence of a contiguity dot and is good, and, as for the problem, 10000 sheet copy paper durability did not appear in the image, either.

[0100]

(Examples 3-5)

L

An electrophotography photo conductor produced like an example 1 except having changed into the amount charge transportation matter of macromolecules which has the repeat structural unit shown by (CT-4) in the amount charge transportation matter of macromolecules used for a charge transportation layer, the amount charge transportation matter of macromolecules which has the repeat structural unit shown by (CT-6), and the amount charge transportation matter of macromolecules which have the repeat structural unit shown by (CT-7), respectively.

[0101]

When the produced electrophotography photo conductor was evaluated like the example 1, the repeatability of 1 dot of 400dpi on an electrophotography photo conductor concerns with the existence of a contiguity dot and was good.

[0102]

(Examples 1 and 2 of a comparison)

The electrophotography photo conductor was produced like the example 1 except having changed into the amount charge transportation matter of macromolecules which has the repeat structural unit shown by (CT-23) in the amount charge transportation matter of macromolecules used for a charge transportation layer, and the amount charge transportation matter of macromolecules which has the repeat structural unit shown by (CT-24), respectively.

[0103]

When the produced electrophotography photo conductor was evaluated like the example 1, the effectiveness of the formation of a laser-beam minor diameter the reappearance size of 1 dot of 400dpi on an electrophotography photo conductor is unstable, and gradation nature is not enough, either, and according to short-wavelength-izing of oscillation wavelength was not acquired, either.

[0104]

[Effect of the Invention]

Even if it uses for electrophotography equipment equipped with an exposure means to have a source of the homogeneous light with a wavelength of 400-410nm according to this invention, this homogeneous light is not absorbed but it has high sensibility, and the mechanical strength of abrasion resistance and damage resistance is strong, and the process cartridge and electrophotography equipment which have the electrophotography photo conductor excellent in repeat stability and this electrophotography photo conductor can be offered.

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing an example of the outline configuration of electrophotography equipment equipped with the process cartridge which has the electrophotography photo conductor of this invention.

[Drawing 2] It is the absorption spectrum of the charge transportation layer film in the synthetic example 2.

[Drawing 3] It is the absorption spectrum of the charge transportation layer film in the synthetic example 3.

[Drawing 4] It is the absorption spectrum of the film of the charge transportation layer in the example 1 of comparison composition.

[Description of Notations]

1 Development Unit (Development Means)

- 1Y Yellow color development counter
- 1M Magenta color development counter
- 1C Cyanogen color development counter
- 1Bk Black color development counter
- 2 Primary Electrification Machine (Electrification Means)
- 3 Laser Exposure Optical Unit (Exposure Means)
- 4 Cleaner (Cleaning Means)
- 5 Imprint Drum
- 6 Anchorage Device (Fixing Means)
- 7 Electrophotography Photo Conductor
- 8 Image Scanner Section (Manuscript Base)

[Translation done.]